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## **Is the whole greater than the sum of its parts? A vending retail study**

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## **Abstract**

**Purpose:** This study aims to identify which elements of the vending marketing mix are the main sources of competitive advantage for the industry, how they impact vending profitability, and what are their related synergistic effects.

**Design/methodology/approach:** A full factorial experiment was developed to determine the effect of eight marketing mix scenarios on the profitability of a new vending channel in a French university library and assess the synergistic effects among three elements of a marketing mix (i.e. product quality, payment system, internal location) identified in a focus group as new sources of industry competitive advantage.

**Findings:** Although the main effects of product quality and payment system were weak-to-modest and insignificant, their interaction effect significantly impacted the daily net profit of the vending channel and generated the highest net synergy. Our results partially challenge the marketing synergy axiom as internal location separately had a stronger impact on profitability than product quality and higher-order interaction effects do not necessarily translate into higher synergistic effects.

**Research implications/limitations:** This research was conducted in a real-life setting, and has limitations, which future researchers can overcome by extending the temporal, geographic, and product scope of the study.

**Originality/value:** The distinction that we introduced between gross and net synergy allowed us to partially challenge the prevailing marketing mix assumption that synergy is always positive (i.e. that a vending retailer can achieve synergy by selecting a combination of marketing mix elements instead of relying on them separately).

Moreover, by demonstrating that marketing synergy is not a uni- but a bi-dimensional concept, we provide vending retailers with a better methodological understanding of why they may have already fallen into the synergy trap and how to avoid it in the future.

**Keywords:** marketing synergy, gross synergy, net synergy, field experiment, vending retail marketing

## 1. Introduction

The whole is greater than the sum of its parts—this famous saying often attributed to Aristotle describes synergy perfectly and concisely. A major marketing axiom states that an enterprise can achieve synergy by selecting the right combination of marketing mix elements instead of relying on them separately (Kehal and El Alfy, 2021). Although this axiom has been operationalised theoretically and in the context of large corporations, empirical evidence of the synergistic benefits of the marketing mix for small- and medium-sized enterprises (SMEs) is lacking, owing to these companies' limited access to external resources (Arrieta-Paredes *et al.*, 2020) and limited budgets for extensive market studies to justify marketing investments (Di Fatta *et al.*, 2018). Gilmore *et al.* (2001) noted that “SME marketing is likely to be haphazard, informal, loose, unstructured, spontaneous, reactive, built upon, and conforming to industry norms” (p. 6). As such, SMEs cannot replicate the marketing strategies of large corporations (Lorente-Martínez *et al.*, 2020), and therefore, different measures of marketing mix effectiveness are required.

The vending industry is an example of an industry in which the majority of vending retailers (*vending machine operators*) are SMEs that have not examined the synergistic effects of their marketing mix (Stoyanov, 2021b). According to Euromonitor International (2020), the revenues of the French market—a mature European vending retail market and the seventh largest worldwide—are expected to grow from €538 million in 2020 to €764.1 million in 2025. Similar to the entire European vending market, the flagship product category in France comprises hot beverages, which represent about 85% of vending sales in the country (La Fédération Nationale de Vente et Services Automatiques, 2021). The market is oligopolistic, and three largest companies—Selecta, Daltys, and Lyovel—account for approximately 82% of the market.

This is unfavourable for microenterprises and SMEs, which represent 90% of all French vending retailers. These companies have limited access to competitive marketing information other than the annual reports of the French vending association, La Fédération Nationale de Vente et Services Automatiques (NAVSA), which are mainly descriptive and available only to association members.

A recent systematic review of vending-related literature revealed that there have been no studies on the retail marketing effectiveness of vending channels and their related marketing synergy (Stoyanov, 2021b). Moreover, the blue-sky speculative schemes have been one of the historical problems in the vending industry since the previous mid-century (Segrave, 2015). Such empirical research would benefit small- and medium-sized vending operators, facilitating new ways of improving their performance and competitiveness, and providing insights that could assist both vending marketers in their initial stages of development or those experiencing an economic downturn.

To bridge these gaps, this study aims to identify which elements of the vending marketing mix are the main sources of competitive advantage for the industry, how they impact vending profitability, and what their related synergistic effects are. Therefore, our contribution to the literature is twofold. First, although largely studied in the context of large corporations, empirical evidence of the marketing synergistic benefits in the vending industry does not exist. We consider vending retail marketing fundamentally different from that of other industries because the vending industry is primarily dominated by SMEs, and their marketing strategies are distinctive from large corporations (Lorente-Martínez *et al.*, 2020). Second, contrary to previous studies that measured marketing synergy through various interaction effects (Batra and Keller, 2016) between the studied marketing variables, we suggested an alternative method of obtaining a more precise estimation of the synergy, and introduced the distinction

between gross synergy (i.e. measured by interaction effects) and net synergy (i.e. gross synergy adjusted against the sum of the individual marketing effects). Moreover, by demonstrating that marketing synergy is not a uni- but a bi-dimensional concept, we provide vending retailers with a better methodological understanding of why they may have already fallen in the synergy trap and how to avoid it in the future.

## **2. Literature review**

### *2.1. Marketing synergy*

According to the Oxford Learner's Dictionaries (2022), *synergy* is “the extra energy, power, success, etc. that is achieved by two or more people, companies, or elements working together, instead of on their own”. Ansoff (1965) first introduced the concept of synergy in a business context to illustrate the joint effects of certain business factors on increasing company value, a result impossible to obtain by individual factors alone.

Scholars have discussed marketing synergy from a strategic standpoint as part of overall corporate synergy, referring to the presumably improved financial performance resulting from a merger or acquisition (Sinkovics *et al.*, 2015) and new service development (Indounas and Arvaniti, 2015). Presenting a systematic framework of factors influencing new product performance at different lifecycle stages, Horvat *et al.* (2019, p. 336) concluded that “a change in [the] marketing synergy may affect [the] marketing function's capability to integrate information and to adjust marketing mix suitability”.

After conducting a meta-analysis of the academic literature published between 1979 and 2011, C. T. Huang and Tsai (2014) determined that marketing synergy is more important for businesses than technology synergy, as the former more significantly improves new product performance.

Synergy, measured through the interaction effects between marketing variables, is a stepping-stone in marketing mix theory (Batra and Keller, 2016). Scholars in the field of integrated marketing communications have studied synergistic effects across various media platforms including paid and owned media (Jayson *et al.*, 2018), online and offline media (Lesscher *et al.*, 2021), and social media and traditional marketing (Kumar *et al.*, 2017). With the growth of the internet and online social networks, researchers have developed models for improving the synergy of out-of-home advertising (Roux and Van der Walddt, 2016) and multimedia engagement (G. Huang and Li, 2016), in which consumers help create media synergy (Schultz *et al.*, 2012) that influences sales (Jayson *et al.*, 2018; Kumar *et al.*, 2017), brand perceptions, and purchase intentions (Dens *et al.*, 2018). However, apart from cross-media synergy, few scholars have empirically studied other marketing mix synergistic effects. Sridhar *et al.* (2017) identified the existence of distribution-determined synergistic effects but failed to provide evidence of three-way interaction (i.e. distribution, promotions, and advertising). By measuring the synergy of different marketing mix elements, under different environmental influencers, and in a new (i.e. vending) context, our study contributes new knowledge to the field and challenges the prevailing marketing mix assumption that synergy is always positive (Table I).

Insert Table 1 about here

For example, Sirower (1997), in his book *The Synergy Trap*, explained that firms are often overly optimistic about the time needed to generate positive synergistic effects and the extent to which performance can improve, and may even forget that synergy can be negative ( $2 + 2 = 3$ ). This can be perilous for SMEs that do not systematically gather and analyse data from the business environment and whose decision-making process is

often based on intuition and the strategic assumptions of larger enterprises. Parrott *et al.* (2010) found a gap between the perceived and actual level of marketing performance of SMEs, and revealed that SMEs' overoptimism about the effectiveness of their marketing programs holds them back from achieving their full potential and becoming highly competitive. This explains the urgent need for SME-specific measures of marketing effectiveness under "the premise that an imperfect measure is better than none" (Brooks and Simkin, 2012, p. 494).

## 2.2. Vending retail marketing

Ever since they were first used to dispense holy water in ancient Egyptian temples (Segrave, 2015), as a non-store retailing concept, vending channels have evolved from standardised and cost-efficient providers of customer convenience to complex marketing solutions able to adapt across target markets (Stoyanov, 2021a). Vending machines belong to the larger customer self-service devices category (Vakulenko *et al.*, 2018) used by companies as novel solutions for automated delivery (Bolton, 2019). Customer self-service devices play an important role in the digital transformation of the retail industry as they revolutionise the omnichannel shoppers' experience (Alexander and Kent, 2022) by proactively engaging them in the value creation process (Wolpert and Roth, 2020).

A recent systematic review revealed that, over the last 20 years, vending retail channels were studied extensively from a social standpoint (to improve health and nutrition in schools and universities) but their retail marketing aspects have been long neglected (Stoyanov, 2021b). Additionally, some studies have been dedicated to inventory management and industrial engineering (Grzybowska *et al.*, 2020). However, the effectiveness of vending marketing tools has not been studied. From a retailer's viewpoint, there are some outdated entrepreneurship guidebooks on launching a vending



machine business (e.g. Entrepreneur Press and Linsenman, 2012). However, they lack a marketing focus and often contain exaggerated profitability predictions (not based on rigorous methodology and scientific evidence), and therefore, SMEs and start-ups cannot have realistic expectations about the marketing effectiveness of vending channels. The lack of research leads to the emergence of blue-sky schemes designed to mislead less experienced market players by promising a bright future while withholding vital information about potential difficulties and uncertainties.

### **3. Methodology**

#### *3.1. Managerial problem*

As a part of a new business concept dedicated to delivering refreshments in captive environments, in 2019, a vending operator wanted to launch a new hot beverage vending channel in a university library in France. It consisted of a freestanding vending machine (not a table-top one), with a push button interface system, not disposing advanced interactive features (e.g. touch screen, customization, and gamification) and dispensing instant (soluble) hot drinks of the same generic private label brand of the retailer rather than from various brands of well-known manufacturers. To reduce the risk of potential losses before officially launching the channel at the beginning of the academic year, we conducted a focus group interview with industry experts to identify the three elements of the vending marketing mix expected to bring significant competitive advantages to the company in the next five years. Then, we ran a series of field experiments to measure the effect of these elements on the profitability of the vending channel.

#### *3.2. Experimental design*

Each experiment detects or confirms the existence of a causal relationship between two or more variables. It includes cases in which the researcher influences a particular

outcome while conditionally controlling for all the major input variables (extraneous variables), except for those intentionally manipulated or measured (Zikmund *et al.*, 2013).

Figure 1 presents the elements of this experiment.

Insert Figure 1 here

### *3.2.1. Independent variables*

Considering that vending retail marketing is an emerging research field (Stoyanov, 2021a; 2021b), we adopted an inductive approach for theory building to select the independent variables for our experimental design, that involved conducting a focus group interview with six managers in different positions in the vending industry to identify the marketing mix elements perceived as the main sources of future competitive advantage in the industry. The results revealed product quality, payment system, and internal location as the primary sources of future competitive advantage (see Appendix). We selected these elements as independent variables in our model because most of the experts agreed on both their importance to the industry and that they can individually as well as jointly bring a positive change in the performance of vending operators. The decision to study only three elements of the marketing mix is not an exception in the synergistic marketing literature (Sridhar *et al.*, 2017).

*Product quality:* Following the comments provided during the focus group interview and Stoyanov's (2021a) definition of product quality in vending channels, this variable was measured according to the presence/absence of a water purification system in the beverage preparation process. This decision was consistent with the emerging sustainability implementations by retailers (Dagilienė *et al.*, 2022) which positively impact retail equity (Sánchez-González *et al.*, 2022). Although, from a microbiological

standpoint, studies have discussed product safety (Raposo *et al.*, 2015) and the reliability of different methods for cleaning water in vending machines (Isah *et al.*, 2020), scholars have not addressed the extent to which consumers appreciate the quality of purified hot beverages or whether the installation of such systems would significantly increase sales for vending operators.

*Payment systems:* Following the comments provided during the focus group interview and Stoyanov's (2021a) definition of vending payment systems, two means of payment were tested: a conventional payment option (i.e. accepting coins from €0.05 to €2) and a mixed payment (combo) option allowing payments in cash and by university smart cards. Although the literature includes theoretical discussions on why vending retailers should adopt one form of payment over another (Solano *et al.*, 2017), it does not provide empirical evidence of the financial impact of these decisions on vending operators.

*Internal location:* Following the comments provided during the focus group interview and Stoyanov's (2021a) discussion of the importance of vending internal locations (e.g. by floor), two experimental locations were examined: the ground floor and the first floor. Acar and Çizmeci (2015) also demonstrated the importance of floor decisions in consumers' selection of retailers. Moreover, the number of studies dedicated to the measurement of the effectiveness of in-store locations for other automated retail formats such as humanoid service robots has multiplied over the last 10 years (De Gauquier *et al.*, 2021). However, in the context of the POS conversion funnel, these studies rely exclusively on soft outcome variables such as attention (i.e. usage and interaction), interest (i.e. looking at the store), desire (i.e. visiting frequency, time spent in front of the

shelves and purchasing in the store), and action (i.e. actual number of consumer purchases).

### *3.2.2. Dependent variable*

In contrast to the majority of the extant retail marketing mix models that rely on soft outcome variables such as satisfaction, purchase intention, purchase behaviour, and word of mouth (Blut *et al.*, 2018), we decided to use profitability (measured through the daily average net profit) to estimate the business performance more precisely. Unlike other hard indicators such as sales revenues, it considers the effect of costs. Moreover, profitability is an important measure of the retail performance that directly influences the remuneration of senior management in charge of the strategic planning within the organization (Feng and Fay, 2020). One study even found profitability to be positively correlated with the customer orientation of the retailers, their adoption of the so-called “customer management mindset” (Han *et al.*, 2021, p. 582). Another typical response variable, profit per customer, was not selected because cash payments do not allow users to identify themselves; it was also difficult to precisely determine which transactions were made by the same client as surveillance cameras were not allowed in the library during the experiment. The distribution of the amounts purchased daily was not considered in the overall model either because we did not expect it to influence the results, as the price for all hot drinks was fixed at €0.40.

### *3.2.3. Extraneous variables*

*Timeframe.* Our experiment lasted two months. Each of the eight marketing mix proposals was carried out in random order and tested over four–six days according to the duration of the university library work week.

*Weather conditions.* It is assumed that people consume hot beverages more frequently in colder weather. Consistent with the growing importance of weather-based marketing in consumer behaviour and retail performance (Tian *et al.*, 2021; Tonkova, 2017), we integrated average daily temperature as a covariate.

*Risk of technical failure.* Although a GPRS module was installed within the vending machine to alert the onsite technician of problems (e.g. stockouts or defective coin receptors), as there were no incidents during the experimental weeks, this variable was not integrated as a covariate in the final model. Moreover, access to perpetual inventory data can be sufficient but not necessary, when forecasting demand and substitution rates of a vending machine (Anupindi *et al.*, 1998) or may have a small effect on the profitability of the vending operators—in case of low demand, low demand volatility, and high profit margins (Ketzenberg *et al.*, 2013).

*Competitive environment.* According to the exclusivity agreement between the library and vending company, no other vending operator was allowed to sell products in the building. The only other location where consumers could buy hot beverages was the canteen outside the library, which served hot drinks with a bar of chocolate at €1.20. The canteen was not considered a direct competitor because of its different positioning strategy. Our direct observations showed that clients were primarily driven to the canteen by hedonic motivations (e.g. sitting at a table on the terrace to enjoy the weather and music, socializing, purchasing a snack along with the drinks) rather than for utilitarian benefits (e.g. convenience, cheap drinks). Although the prices of the hot beverages in the canteen and its work hours were recorded daily, as they remained constant during the experimental weeks, these variables were not integrated as covariates in the final model.

*Library traffic.* Owing to the specificity of the experimental environment (i.e. the

vending channel is an unattended retail format, and surveillance cameras for commercial purposes are prohibited on campus), it was impossible to select the experimental units randomly or collect consumer-specific data at the point of sale to control for potential self-selection biases (e.g. age, gender). Therefore, the traffic was alternatively measured through Google Maps (i.e. popular times) and crosschecked with the library personnel to establish three levels of daily frequency: low, medium (normal), and high. Moreover, Kumar *et al.* (2017) found that time-varying effects significantly influence marketing synergy, and therefore, variables for measuring the latent demand and lagged purchase behaviour due to previous marketing activities have been regularly integrated into synergistic models (Lesscher *et al.*, 2021; Sridhar *et al.*, 2017).

*Library accessibility.* The library's daily work hours were considered a covariate in the model to separate the experimental treatments from the effects of different accessibility. There were no differences in the accessibility of the different floors, as visitors of the library accessed multiple shortcuts to move between the floors freely.

### 3.4. Conceptual model

Based on our methodological framework, and consistent with the results from the focus group, the conceptual model in Figure 2 considers the main and interaction effects simultaneously. The following research hypotheses were tested:

- H1.* Product quality has a positive effect on the profitability of the vending channel.
- H2.* The payment system has a positive effect on the profitability of the vending channel.
- H3.* The internal location has a positive effect on the profitability of the vending channel.
- H4.* The two-way interaction of product quality and payment system has a positive effect on the profitability of the vending channel.

*H5.* The two-way interaction of product quality and internal location has a positive effect on the profitability of the vending channel.

*H6.* The two-way interaction of the payment system and internal location has a positive effect on the profitability of the vending channel.

*H7.* The three-way interaction of product quality, payment system, and internal location has a positive effect on the profitability of the vending channel.

Insert Figure 2 here

## **4. Results**

To examine the main and interaction effects, we conducted a three-way ANCOVA, before which we had found no multicollinearity between the covariates because, as suggested by Terblanche and Kidd (2021), all the values for the variance inflation factors (VIF) were below the established threshold of 5: traffic, tolerance = 0.859, VIF = 1.165; daily temperatures = 0.895, VIF = 1.118; accessibility, tolerance = 0.954, VIF = 1.049. During the post hoc analysis, we conducted pairwise comparisons using the least significant difference (LSD) procedure to determine the extent to which the marketing mix producing the highest covariate-adjusted profits differed from other estimated marginal means.

### *4.1. Descriptive statistics*

The summary of the main descriptive statistics of the full factorial experimental design is presented in Table II, and the original experimental dataset is available on request. To generate the highest covariate-adjusted profitability, the vending operator should use the seventh marketing mix proposal that involves installing a water purification system, mixed payment options, and the ground floor of the university library as the location. In this scenario, the company can expect to generate daily profits of approximately €20.

Insert Table II here

## 4.2. Measuring the main, interaction, and synergistic effects

### 4.2.1. ANCOVA results

The results revealed that the model was valid:  $R^2 = 0.751$ ,  $F(1; 10) = 9.946$ ,  $p < 0.001$ , and the three-factor interaction had a significant effect on the net daily profit of the vending channel, where  $F(1; 33) = 22.334$  and  $p < 0.001$  (Table III). None of the integrated covariates in the model were significant: traffic  $F(1; 33) = 1.671$ ,  $p = 0.205$ ; daily temperature  $F(1; 33) = 2.638$ ,  $p = 0.114$ ; accessibility  $F(1; 33) = 1.555$ ,  $p = 0.221$ . Among the main effects, only the location was significant where  $F(1; 33) = 7.942$ ,  $p < 0.01$ , and two-way interaction effects were significant for product quality-payment system where  $F(1; 33) = 10.111$ ,  $p < 0.005$  and payment system-internal location where  $F(1; 33) = 22.824$ ,  $p < 0.001$ .

Insert Table III here

Although the covariates were insignificant, they serve a control function in the model and can explain to a certain extent the variance (which may be smaller, but will not be zero). Moreover, the conventional theory of statistical significance based on the alpha thresholds is sometimes debatable (Field, 2018). Therefore, we retained the covariates because the deletion of these variables can bias other variables in the model (e.g. the covariate-adjusted dependent variable). Similarly, we did not exclude the other insignificant effects of the research model in Figure 3 because removing the main or two-way interaction effects can bias the analysis results, especially when these effects are part of higher-order interactions. Moreover, each of the studied marketing mix variables is theoretically important for the competitiveness of vending operators.



To measure the magnitude of the statistically significant effects on daily net profit, we relied on partial eta squared ( $\eta_p^2$ ), for which Cohen (1988) suggested the following thresholds: small effect ( $\eta_p^2 = 0.01$ ), medium effect ( $\eta_p^2 = 0.06$ ), and large effect ( $\eta_p^2 = 0.14$ ). In this study, the main effect of the location was large ( $\eta_p^2 = 0.194$ ), along with the two-way interactions of product quality-payment system ( $\eta_p^2 = 0.235$ ) and payment system-internal location ( $\eta_p^2 = 0.409$ ). The three-factor interaction effect, which accounted for 40.4% of the changes in the registered values for daily net profit, also had a strong effect on the experimental outcome ( $\eta_p^2 = 0.404$ ). Therefore, H3, H6, and H7 were confirmed and H1, H2, H4, and H5 were rejected.

Insert Figure 3 here

#### 4.2.2. Marketing synergy effects

Contrary to the extant literature that traditionally measures marketing synergy simply through various interaction effects between the studied marketing variables (Batra and Keller, 2016), we believe that the interaction can be useful in measuring gross marketing synergy (Figure 4). However, whenever possible, interaction should be adjusted by deducting the sum of the individual marketing effects for a more precise estimation of net marketing synergy because gross synergy simply measures the co-created but not the newly added or incremental synergistic.

$$\text{Net marketing synergy} = \text{Gross marketing synergy} - \text{Sum of the individual effects} \quad (1)$$

$$\text{Positive net synergy} = \text{Sum of the individual effects} < \text{Gross marketing synergy} \quad (2)$$

$$\text{Negative net synergy} = \text{Sum of the individual effects} > \text{Gross marketing synergy} \quad (3)$$

Insert Figure 4 here

We identified both positive and negative net synergies (Table IV). Positive marketing synergies for the vending channel were observed in the cases of the two-way interactions of product quality-payment system ( $1.7\% + 1.5\% < 23.5\%$ ) and payment system-internal location ( $1.5\% + 19.4\% < 40.9\%$ ), and the three-factor interaction ( $1.7\% + 1.5\% + 19.4\% < 40.4\%$ ). The remaining two-factor interaction of product quality-internal location had less effect on the profitability of the vending operator than the sum of their individual main effects, which can be partially explained by the insignificant but moderately strong product quality main effect.

Insert Table IV here

The results demonstrated in Figure 5 highlight the importance of distinguishing between gross and net marketing synergy, and provide evidence that if companies measure gross synergy, they can be easily misled and fall into the so-called “*synergy trap*”. For example, PQ\*IL generated a positive gross synergy of + 6.7% but a negative net synergy of -14.4%. Similarly, the net synergy scores of PS\*IL and PQ\*PS\*IL were approximately two times lower than those of their gross synergies. Only the score of PQ\*PS, net and gross synergy were quite similar (23.5% vs 20.3%) due to the insignificance of each of the individual effects involved in the interaction.

Insert Figure 5 here

#### *4.3. Marketing mix pairwise comparisons*

To facilitate the pairwise contrasts between the 2 (product quality)  $\times$  2 (payment system)  $\times$  2 (internal location) experimental scenarios, all the possible eight sets of marketing factors were conducted as a simple one-way ANCOVA (Table V) followed by a post hoc LSD procedure (Table VI). These analyses confirmed the statistically significant differences

among the various marketing mix proposals ( $F(10; 33) = 9.946, p < 0.001$ ) while revealing the estimated marginal mean differences between the winning seventh marketing mix proposal (MM<sub>7</sub>), identified earlier, as the most beneficial for the company and all other experimental marketing mix scenarios.

Insert Table V here

Insert Table VI here

## 5. Discussion and concluding remarks

This study presented the results of a focus group interview followed by a full factorial experiment to measure the individual and interaction effects among product quality, payment system, and internal location factors on the profitability of a vending channel.

### 5.1. Theoretical implications

Although the combination of the three marketing variables considered had a substantial effect on the profitability of the vending channel ( $F(1; 33) = 22.334, p < 0.001, \eta_p^2 = 0.404$ ), the individual effects of only one of them (i.e. internal location) was significant and strong on profitability ( $F(1; 33) = 7.942, p < 0.010, \eta_p^2 = 0.194$ ). These findings can be explained to a certain extent by the importance of the general location factor in vending retail marketing (Stoyanov, 2021a) and the fact that internal location was the only factor in our focus group on which each of the experts agreed regarding its importance.

Our study's findings contradict the extant literature that asserts that the type of payment options provided by a retailer varies across target markets (Stoyanov, 2021a) because it can enhance the business performance (Adhikary *et al.*, 2021). In our case, the

individual effect of the payment system on the profitability of the vending retailer was insignificant. This can be explained by the fact that consumers may have the same willingness to use or not the services of a retailer based on whether more or fewer payment options are available to them (to use only cash instead of a choice between cash and cashless). Consumers may have already been used to both types of systems and neither of them provides necessarily more convenience and therefore does not correspond to a different level of purchase intention and profitability. For example, in France, vending channels are already in their maturity stage of the life cycle and consumers have probably learned over the years (e.g. through behavioural and observational learning) that they should always have money in cash before going for a vending purchase (e.g. just in case). On the other hand, in the context of the theory of bounded rationality (Simon, 1990), the availability of more payment options may not necessarily be more beneficial to the consumers as it may require from them more cognitive efforts in the decision-making process. Moreover, the library is in a way a working place where cognitive overload may occur. However, in our study, the payment system was having a significant impact on the profitability when interacting with other marketing variables—this may be because convenience mediates between digital payments options and high purchase intention, and is dependent on personal adoption (Boden *et al.*, 2020).

Although the main effects of product quality and payment system were weak-to-modest and insignificant ( $F_1(1; 33) = 0.572, p = 0.455, \eta_p^2 = 0.017$ ; ( $F_2(1; 33) = 0.487, p = 0.490, \eta_p^2 = 0.015$ ), their interaction effect had a large and significant impact on the vending channel's daily net profit ( $F(1; 33) = 10.111, p < 0.001, \eta_p^2 = 0.235$ ), generating the highest net synergy (20.3%). Additionally, combined with the internal location only,

the product quality main effect neutralised the strong and significant individual location effect and converted the two-way product quality-internal location to a moderately strong insignificant effect ( $F(1; 33) = 2.382, p = 0.132, \eta_p^2 = 0.067$ ), generating the highest negative net synergy (-14.4%). This suggests that large effects are associated with large positive synergies, whereas a negative synergy can be related to a moderately strong effect, hidden behind an insignificant interaction effect or a positive gross synergy. The net synergistic effects generated from each of the two-way interaction effects of the payment system and internal location (20%) and product quality and payment system (20.3%) were higher than those of the three-way interaction (17.8%).

Based on our results, we partially challenged the marketing axiom that synergy can be achieved by selecting the right combination of marketing mix elements instead of relying on them separately (Kehal and El Alfy, 2021). We found that internal location separately had a stronger impact on profitability than with product quality and that higher-order interaction effects do not necessarily translate into higher synergistic effects, as the net synergy generated by PQ\*PS and PS\*IL was higher than that of PQ\*PS\*IL. One of the reasons for these results is that—similar to the natural sciences—there may be a threshold (i.e. saturation point) for the increase in synergy, along with that in the order of interactions (Okawa *et al.*, 2018). We posit that companies of all sizes—and especially SMEs—should measure the soundness of their investments in advance and seek the optimal rather than the maximum number of marketing solutions. When relying on intuition or incomplete information, marketers can easily fall into the synergy trap and overspend their marketing budget because synergy can be a more complex and less easily predictable concept than a regular math problem (e.g.  $1 + 1 = 1$ ;  $2 > 3$ ). Piening and Salge (2015) found that the number of different innovation activities

in which a company was involved had a linear relationship with their innovation effectiveness, but the marginal effect became negative when the company's engagement in innovations exceeded six activities, and other studies have demonstrated the conditional nature of the underlying assumption in resource management that "more is better" (Liu *et al.*, 2021) and the need for a company to adopt its mix of marketing capabilities to generate the highest market performance (Guo *et al.*, 2018). Finally, the two types of marketing synergy that we introduced are in accordance with the findings of Sridhar *et al.* (2017)—that is, as unreliable metrics can negatively affect the strategic decisions that marketers make and increase overspending, "two independent noisy metrics are better than one even when the second metric is noisier" (p. 761).

### *5.2. Managerial implications*

The neglect of vending retail channels has contributed to recent worldwide negative sales trends. Our findings can benefit all companies in the vending industry (e.g. manufacturers, retailers, and suppliers), not only in France but also globally. Although optimising a mix of marketing variables is not a novel concept in scientific literature, the optimisation of these variables has not been studied in a vending context—which is potentially problematic, as synergistic effects are always context-specific, contingent, and empirically established (Corning, 2010). This study makes a significant contribution to the literature by supplying the means of evaluating the magnitude of the marketing mix synergy in a vending setting while providing evidence for its complex nature. This study's methodology can be employed by both national and regional vending associations for the establishment of guidelines for new vending channels, thereby reducing the potential risk of channel failures. The distinction we propose between gross and net synergy can be successfully applied to any company or industry regardless of

size, and can also serve as an additional tool for identifying hidden synergy traps or validating the findings of previous studies that relied on interaction effects to measure synergy.

This study's findings can also benefit traditional brick-and-mortar retailers because the adoption of customer-facing in-store by SMEs is still in its infancy (Lorente-Martínez *et al.*, 2020). Moreover, it is important to track the evolution in the implementation of these in-store innovations (Alexander and Kent, 2021), especially when they are a part of the business model called "retailer in a retailer shop" (e.g. Picot-Coupey *et al.*, 2018, p. 916). With a better understanding of how to measure the synergistic effects of vending channels, retailers may be able to predict their expected return on investment more accurately and determine the resources they should spend on vending marketing more easily than when traditional store retailers faced severe competition from the "new generation-oriented channels" (Paul and Rosenbaum, 2020, p. 3).

### *5.3. Limitations and directions for further research*

Some limitations of this study need to be acknowledged. First, as this research was inspired by an actual business case and was conducted in a real-life setting, certain objective constraints existed in designing the experimental framework. Future scholars can overcome these by extending the temporal, geographic, and product scope of studies and developing a research model involving more experimental variables, vending channels, and carryover effects. As mentioned by Mann *et al.* (2015), "retailers attempting to reassess their business strategies can benefit from a systematic view of the strategic decisions that can be made in various functional areas to realign their resources and strategic focus/orientations with an evolved business environment" (p. 776). For

example, the performance of retailers can be influenced by a myriad of factors from both the internal and external environment, and studied not only through linear but also through non-linear relationship models (e.g. Tartaglione *et al.*, 2019). Moreover, the absolute values of the daily net profits recorded during the experiment seem relatively low to justify the value of exploring synergies but this can be explained by the low selling price of the hot beverages (i.e. €0.40) and the short timeframe of the recording of the outcome (i.e. daily). Accordingly, we did not interpret the absolute values of the synergy through the sum of the squares method, but instead interpreted the relative synergy through the effect sizes of the partial square coefficients.

Second, although we identified certain marketing synergies in our study—ranging from -14.4% to 20.3%—the marketing literature has no established classification framework for the magnitude of synergistic effects, and these percentages could not be meaningfully interpreted as low, moderate, or high. For example, in the discipline of toxicology in the natural sciences, the combined effect of two elements should often be many times greater than the sum of their individual effects— $2 + 2 \ggg 4$  (10 times or even more)—for it to be categorised as synergistic and not simply as an additive effect such as  $2 + 2 = 4$  (Canadian Centre for Occupational Health and Safety, 2022). Future scholars should be inspired by the progress in other scientific domains to determine the marketing-specific boundaries of synergy.

Finally, with the increasing importance of unattended retail which—along with vending machines—includes unattended convenience stores and supermarkets at the test stage (Yao *et al.*, 2020), future scholars can adopt a cross-channel channel perspective in measuring marketing synergy while integrating spillover effects (e.g. Kim and Lee, 2020). Guissoni *et al.* (2021) found that in difficult economic times, distribution through



self-service channels is more effective than through full-service channels in improving retailers' market share. Considering the recent COVID-19-related disruption of SMEs (Sinha and Sainy, 2021), it would be interesting to investigate in a comparative study how the sources of competitive advantage and their related synergies vary when vending channels result from a partial rather than complete convergence of the various self-service technologies (Stoyanov, 2021a) or between self-service and full-service retail channels.

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Table I. Overview of the literature on marketing mix synergy

Authors	Vending context	Experimental design	Controlled environmental influencers	Marketing mix variables	Effectiveness	Type(s) of synergy measured	Type(s) of synergy confirmed
Schultz <i>et al.</i> (2012)	No	No	Product type Media exposure before and after reaching the intended retail location	Promotion media consumption Brand media consumption Social media consumption In-store media consumption	Purchase intention of heavy users	Consumer-generated media	Positive
Kumar <i>et al.</i> (2017)	No	No	Seasonality Product price Brand type Distribution channel	Facebook impressions TV advertising Product sampling In-store promotions	Sales revenues	Cross-media	Positive
Sridhar <i>et al.</i> (2017)	No	No	Retail offtakes, Secondary sales, Latent demand	Advertising spending Promotional timing Distribution intensity	Sales volumes	Distribution–Promotion Distribution–Advertising	Positive
Dens <i>et al.</i> (2018)	No	No	Seasonality Sociodemographics Campaign type Brand type	Consumers’ usage frequency of media platforms (magazines, online, and TV)	Brand interest Brand equity Purchase intention	Cross-media	Positive and negative

Jayson <i>et al.</i> (2018)	No	No	Product category Brand type	Owned media ad expenditure Paid media ad expenditure	Sales growth rate	Cross-media	Positive
Lesscher <i>et al.</i> (2021)	No	Yes	Sociodemographics Competition Lagged purchase behaviour	Direct mailing Display advertising	Awareness and search Consideration Sales volumes	Cross-media	Positive
This study	Yes	Yes	Consumer traffic Daily temperature Accessibility	Product quality (PQ) Payment system (PS) Internal location (IL)	Net profit	PQ*PS PQ*IL PS*IL PQ*PS*IL	Positive and negative

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Table II. Descriptive statistics of daily net profit in each marketing mix scenario

Marketing mix	Product quality	Payment system	Location	Obs.	Mean	SD	Covariate adjusted mean	Covariate adjusted SE
1	No	Conventional	Level 1	6	12.00	2.00	13.18	1.44
2			Level 2	6	11.83	3.31	11.66	1.35
3		Combination	Level 1	4	10.25	1.71	10.14	1.69
4			Level 2	5	10.20	3.15	9.53	1.38
5	Yes	Conventional	Level 1	6	7.33	1.86	5.83	1.57
6			Level 2	5	10.40	1.14	11.10	1.41
7		Combination	Level 1	6	19.83	5.78	19.75	1.29
8			Level 2	6	4.33	1.51	4.96	1.41

Note: Obs. (observations) = number of working days on which the experimental treatments were conducted

Table III. Three-factor interaction effect on the daily net profit

Source	Sum of squares	<i>df</i>	Mean square	<i>F</i>	Partial eta squared
Corrected model	866.902	10	86.690	9.946***	0.751
Intercept	53.258	1	53.258	6.110*	0.156
Traffic	14.568	1	14.568	1.671	0.048
Daily temperature	22.993	1	22.993	2.638	0.074
Accessibility	13.553	1	13.553	1.555	0.045
Product quality (PQ)	4.984	1	4.984	0.572	0.017
Payment system (PS)	4.241	1	4.241	0.487	0.015
Internal location (IL)	69.225	1	69.225	7.942*	0.194
PQ*PS	88.133	1	88.133	10.111**	0.235
PQ*IL	20.763	1	20.763	2.382	0.067
PS* IL	198.948	1	198.948	22.824***	0.409
PQ*PS*IL	194.676	1	194.676	22.334***	0.404
Error	287.644	33	8.716		
Total	6304.000	44			
Corrected total	1154.545	43			

Note:  $R^2 = 0.751$ ; Adjusted  $R^2 = 0.675$ ; \*  $p < 0.01$ ; \*\* $p < 0.005$ ; \*\*\* $p < 0.001$

Table IV. Effect of marketing synergy on vending channel profitability

	Gross marketing synergy (%)	Sum of individual effects (%)	Net marketing synergy (%)
PQ*PS	23.5	3.2	20.3
PQ*IL	6.7	21.1	-14.4
PS*IL	40.9	20.9	20
PQ*PS*IL	40.4	22.6	17.8

Table V. Summary of the one-way ANCOVA

Source	Sum of squares	<i>Df</i>	Mean square	<i>F</i>	Partial eta squared
Corrected model	866.902	10	86.690	9.946**	0.751
Intercept	53.258	1	53.258	6.110*	0.156
Traffic	14.568	1	14.568	1.671	0.048
Daily temperature	22.993	1	22.993	2.638	0.074
Accessibility	13.553	1	13.553	1.555	0.045
Marketing mix	670.437	7	95.777	10.988**	0.700
Error	287.644	33	8.716		
Total	6304.000	44			
Corrected total	1154.545	43			

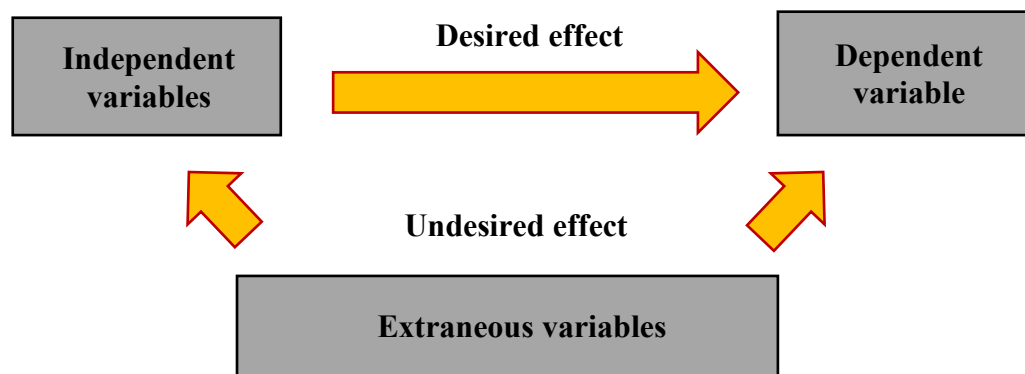
Note:  $R^2 = 0.751$ ; Adjusted  $R^2 = 0.675$ ; \*  $p < 0.01$ ; \*\* $p < 0.001$



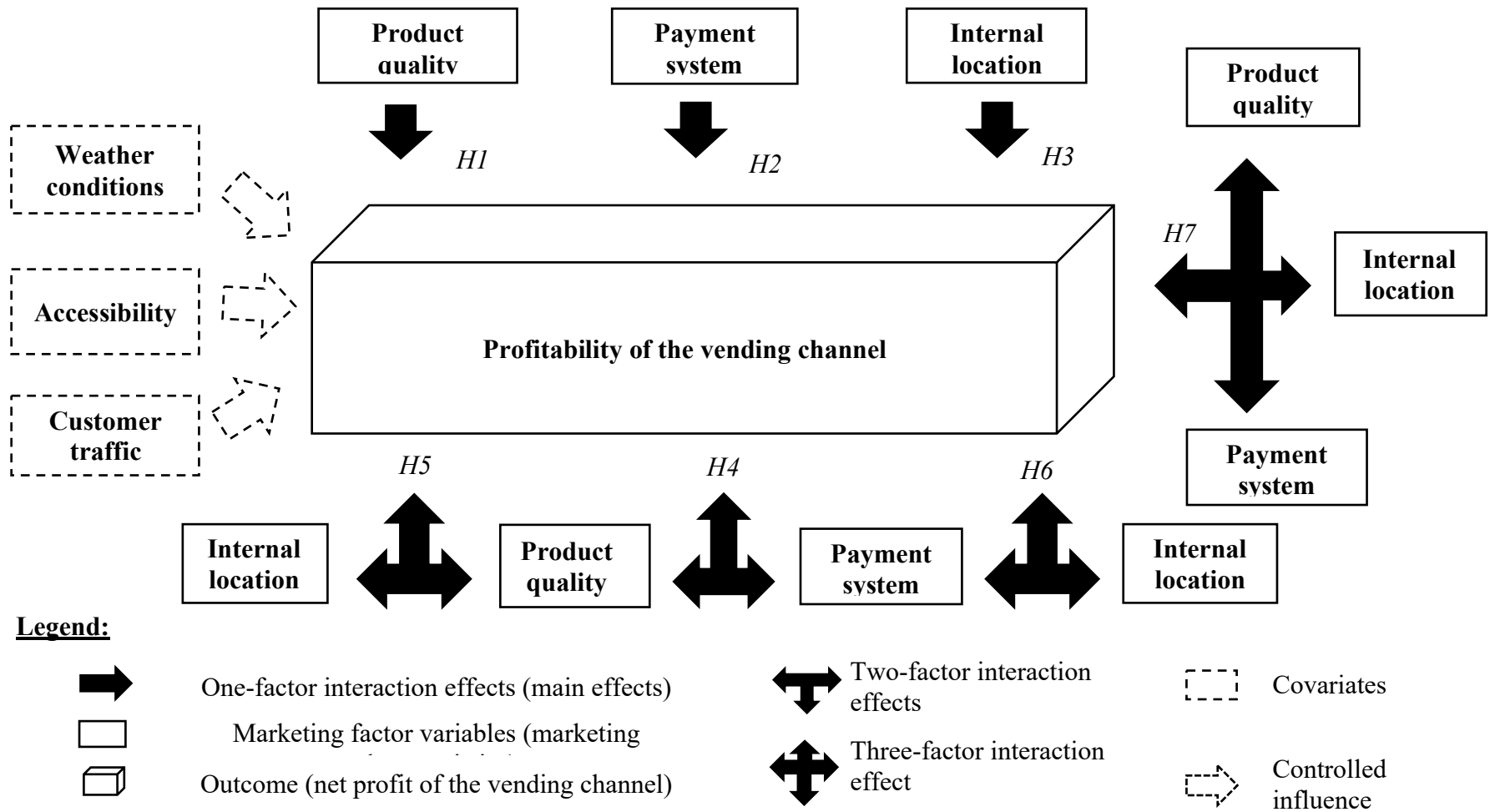
Table VI. Pairwise comparisons of the marginal mean differences using the LSD method

Marketing mix (I)	Marketing mix (J)	Marginal mean difference (I-J)	95% confidence intervals	
			Lower	Upper
MM <sub>7</sub>	MM <sub>1</sub>	6.57*	2.83	10.31
	MM <sub>2</sub>	8.09**	4.01	12.17
	MM <sub>3</sub>	9.61**	5.64	13.57
	MM <sub>4</sub>	10.22**	6.43	14.00
	MM <sub>5</sub>	13.92**	9.57	18.27
	MM <sub>6</sub>	8.65**	4.91	12.39
	MM <sub>8</sub>	14.79**	10.58	18.99

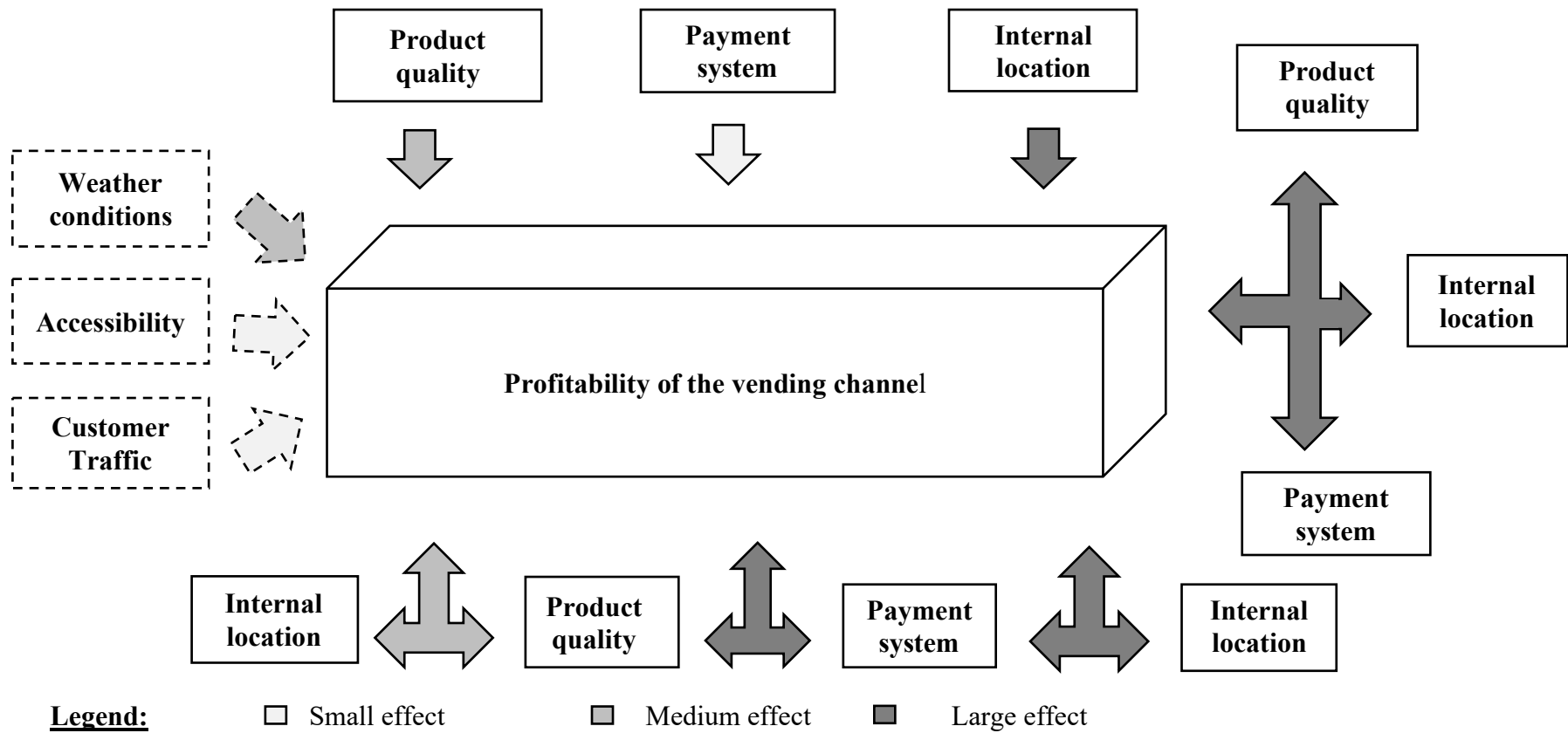
Note: \* $p < 0.005$ ; \*\*



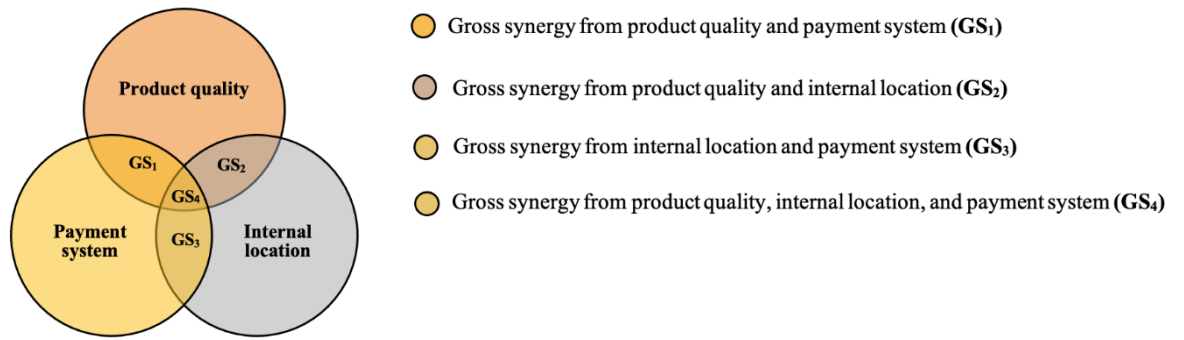
**Figure 1** Structural elements of the experimental design



**Figure 2** A conceptual model for measuring the marketing effects in the three-factorial experiment

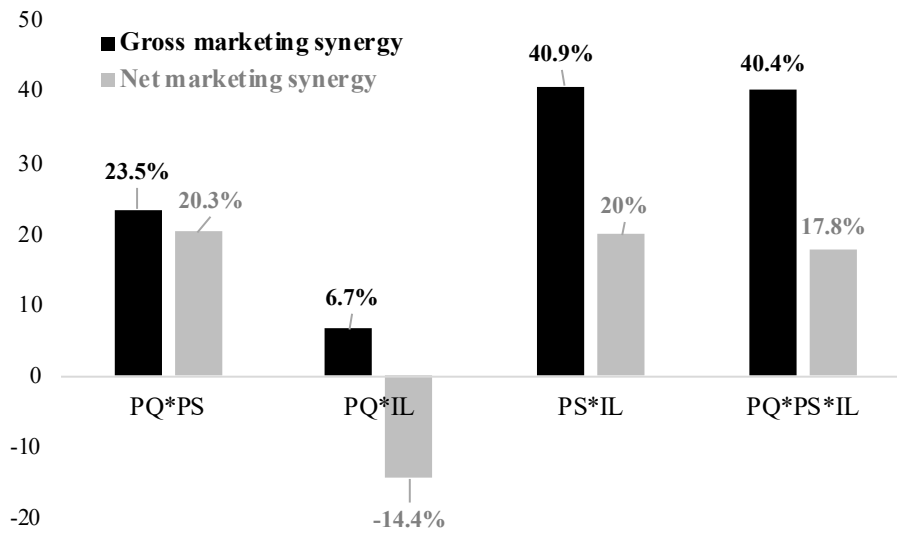


**Figure 3** Marketing effects on the average daily profit of the vending channel



**Figure 4** Cross-dimensional gross marketing synergies in vending

Source: author's development



**Figure 5** Identified gaps between gross and net marketing synergy

## Appendix

### Summary of main results from focus group interview with industrial experts

Identified themes	Expert*	Which marketing tools do you expect to be the main sources of competitive advantage for the industry in the next five years?
<i>Product quality</i>	1	“Quality first! Cliché or not, if you don’t deliver qualitative products, you’ll soon be out of the business”.
	3	“An industrial misconception is that the quality of the service [self-service] should come before that of product quality. For example, a water purification system is something that the new generation of sustainable consumers expects, and the industry should deliver it”.
	4	“We should continue improving our products.....Quality equals profitability”.
	6	“I partially agree with you [Expert 3] that vending operators can capitalise on the new generation of responsible consumers by improving product quality, but it should not be at any costs because these consumers can be at times overdemanding”.
<i>Payment system</i>	1	“Cashless payments will completely revolutionise our industry, actually they are already doing it”.
	2	“I agree, we are all going to face the battle of the payments. It will be the “battle of the ages”.
	4	“I believe in the diversity of payments, but that decision should be financially viable because that kind of investment is not negligible”.
	5	“Cash payments are obsolete, long live smart payments. They will be the norm in the years to come”.
	6	“The industrial marketing offer is already mature and quite standardised. However, payment systems are still in their infancy. ....Those [vending operators] that manage to provide them to the new generation of consumers while keeping the conventional ones for the “regulars” will capture the largest part of the market”.
<i>Internal location</i>	1	“I completely agree with you [Expert 6]. Earlier, our company was also interested in simply gaining access to important office buildings .... but over time we realised that it actually matters a lot and in the future we will carefully estimate the floor profitability potential because corporate buildings often have multiples floors”.
	2	“A machine installed on the ground floor of a hotel lobby or a hospital can attract additional traffic and will certainly not generate the same amount of revenues as another one installed on the higher floors in the same building and the difference will not at all be negligible”.
	3	“When you choose your floor, you choose your segment. New floors should be targeted in the future rather than the conventional ones”.
	4	“I agree with you [Expert 2] on the importance of internal locations, but sometimes higher floors can generate higher revenues”.
	5	“Better understanding the potential of each floor location is key, [it] means deeper market penetration. If companies want to grow beyond their current scope of “dwarves retailers”, they should start serving the same buildings as other vending retailers but on different floors”.
	6	“Location, location and location but not any location. The last few decades, vending operators have been competing on the external locations, but as nowadays many of the profitable public and private locations are already exploited by the industry, floor locations should become the primary focus of vending retailers even in a situation where another vending retailer is also be present in the same building”.

\*Note: Some experts did not discuss some of the identified themes, explaining why they were mentioned only by a few of them. The full dataset is available on request.